

 University of Colorado at Boulder

Center for Astrophysics and Space Astronomy

Campus Box 389

Boulder, Colorado 80309-0389

(303) 492-4050

SPAN Address—CYGNUS: OFFICE

FAX: (303) 492-7178

## FINAL REPORT ON NASA CONTRACT NAG 5-1016

Peter S. Conti 1 September 1993

This contract covered observations and analyses of spectroscopic data obtained with the IUE satellite, and combined several separate investigations. While this is the formal final report, there is still work going on which is at yet not completed or submitted for publication.

As part of the PhD efforts of students Pat Morris and Ken Brownsberger, we have been acquiring and reducing IUE spectra on Wolf-Rayet stars of the Galaxy, LMC and SMC. While some of these data have come from archival sources, much was obtained several years ago under this program. The IUE data has been combined with optical and near IR fluxes, and a reddening correction, based upon nulling the 2200Å interstellar feature, has been adopted. We found that a single power law spectrum can describe the spectrum from the IUE region all the way to 1 micron. The slope of this power law is about 2.8 (the Rayleigh-Jeans limit is 4.0), with differences among the various stars, due to their different mass loss rates. A paper describing these results has been published (Morris, Brownsberger, Conti, Massey and Vacca ApJ 412, 324-340, 1993).

Morris, Conti, Lamers and Koenigsberger (ApJL 414, L25, 1993) have discovered a "Baldwin Effect" in the emission line spectra of single WN stars of the Large Magellanic Cloud. The "Baldwin Effect" is an inverse relationship between emission line equivalent width and intrinsic luminosity, first found in quasars. The Effect was found to be present in those WN stars for which the distances, hence luminosities, were known. This relationship can now be used as a distance indicator for WN stars of our Galaxy. The Effect is present in WN stars for simple geometric reasons: the lines and continuum are formed in different spherical emitting volumes which scale as the density, and luminosity.

Conti and William Vacca, now at UC Berkeley on a Hubble Fellowship, obtained spatially integrated spectra of the giant HII regions 30 Dor in the LMC, and NGC 346 in the SMC. The data have been analyzed by our colleagues Drs. Leitherer and Robert at STScI utilizing a spectral synthesis technique to estimate the numbers of O and W-R stars present in the integrated spectra. The results compare favorably with the actual census of stars in the same areas which are already available. The thrust of the work is to fully test the accuracy of spectral synthesis techniques in predicting stellar populations in more distant galaxies where individual star counts are impractical. A paper is being prepared for publication.

N94-70765

Unclas

29/89 0183094

 (NASA-CR-194165)  
 (Colorado Univ.)  
 FINAL REPORT  
 2 p

Conti and Vacca also obtained SWP spectra of five Wolf-Rayet galaxies. These are a subset of starburst emission line galaxies in which there is evidence in the integrated spectrum for substantial numbers of Wolf-Rayet stars. We will utilize the far-UV spectrum to estimate the numbers of OB stars present from the P Cygni profiles of SiIV and CIV. These features can be utilized in a spectral synthesis program, as above, to obtain the massive star population. These data has been acquired and analysis is proceeding.

Conti, in collaboration with a group at University College London, headed by Dr. Allan Willis, has obtained a series of continuous observations of HD 50896 in January 1992. VILSPA time was also allocated for this international program which will attempt to obtain simultaneous observations at many other wavelengths. HD 50896 is the brightest WN star in the sky and has a number of enigmatic properties which we are attempting to sort out during the dedicated four day observing period. Analysis is currently underway.

Several other papers having to do with the emission line spectra of W-R stars are in various stages of completion by Brownsberger and Morris as part of their PhD theses. These will necessarily have to be reported upon under other NASA reports as future funding is coming under different contract numbers.